



04/07/00

Docket No.: VI/96-068.RE.C

A/PET

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Continuing Reissue Application of:)

UBER et al.)

U.S. Patent No.: 5,494,036)

Art Unit: 3737)

Issued: February 27, 1996)

Filed: November 26, 1993)

Examiner: Brian L. Casler)

For: PATIENT INFUSION SYSTEM)

FOR USE WITH MRI)

REISSUE PATENT APPLICATION TRANSMITTAL

Assistant Commissioner
for Patents
Box Reissue
Washington, D.C. 20231

Dear Sir:

The enclosed reissue application is a continuing reissue application for utility U.S. Patent No. 5,494,036.

Section 120 Priority Claim:

The enclosed application claims the benefit under 35 U.S.C. Section 120 of pending Parent Reissue Application Serial No. 09/027,852, now U.S. Reissue Patent No. 36,648.

Continuing Reissue Application Elements:

The following Application Elements are enclosed herewith:

- Reissue Application Fee Transmittal Form (in duplicate);
- Specification, Claims and Drawings of Original Patent No. 5,494,036 (centered on pages);
- Four (4) Reissue Declarations (copies from Parent Reissue Application Serial No. 09/027,852);
- Surrender of Original Letters Patent;
- Assent of Assignee;

- Statement under 37 C.F.R. Section 3.73(b); and
- Power of Attorney

Accompanying Continuing Reissue Application Parts:

The following Accompanying Application Parts are enclosed herewith:

- Request for Transfer of Drawings (with Formal Drawings attached);
- Information Disclosure Statement;
- Four (4) Forms PTO-1449 and cited references;
- Preliminary Amendment;
- Return Receipt Postcard; and
- Certificate of Express Mailing.

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Customer Number: 21140



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21140

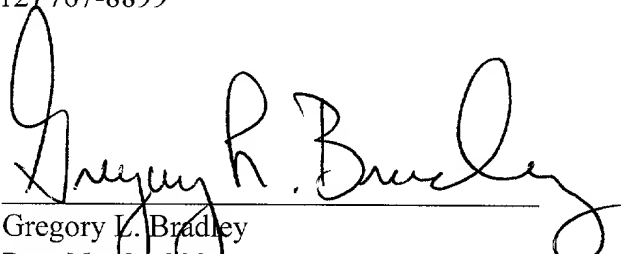
PATENT TRADEMARK OFFICE

Correspondence Address: Gregory L. Bradley
Medrad, Inc.
One Medrad Drive
Indianola, PA 15051

Phone: (412) 767-2400 x3021

Fax: (412) 767-8899

Dated: April 7, 2000



Gregory L. Bradley
Reg. No. 34,209

Medrad, Inc.
One Medrad Drive
Indianola, PA 15051
(412) 767-2400 x3021

CERTIFICATE OF MAILING BY "EXPRESS MAIL" (37 CFR 1.10)Applicant(s): **Uber, III et al.**

Docket No.

VI/96-068.RE.CSerial No.
to be assignedFiling Date
April 7, 2000Examiner
Brian L. CaslerGroup Art Unit
3737Invention: **PATIENT INFUSION SYSTEM FOR USE WITH MRI**I hereby certify that this **Reissue Application and related papers***(Identify type of correspondence)*

is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under
37 CFR 1.10 in an envelope addressed to: The Assistant Commissioner for Patents, Washington, D.C. 20231 on

April 7, 2000*(Date)***Gregory L. Bradley***(Typed or Printed Name of Person Mailing Correspondence)*
*(Signature of Person Mailing Correspondence)***EL104099198US***("Express Mail" Mailing Label Number)***Note: Each paper must have its own certificate of mailing.**

STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: MEDRAD, INC.

Application No./Patent No.: 5,494,036 Filed/Issue Date: Issued: 2/27/1996

Entitled: PATIENT INFUSION SYSTEM FOR USE WITH MRI

Medrad, Inc., a Corporation,
(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that it is:

1. ☒ the assignee of the entire right, title, and interest; or
2. ☐ an assignee of an undivided part interest

in the patent application/patent identified above by virtue of either:

A. ☒ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the Patent and Trademark Office at Reel 6897, Frame 0942 or for which a copy thereof is attached.

OR

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as shown below:

1. From: _____ To: _____
The document was recorded in the Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.
2. From: _____ To: _____
The document was recorded in the Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.
3. From: _____ To: _____
The document was recorded in the Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

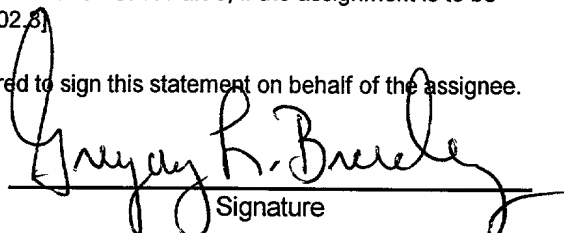
☐ Additional documents in the chain of title are listed on a supplemental sheet.

☐ Copies of assignments or other documents in the chain of title are attached.

[NOTE: A separate copy (i.e., the original assignment document or a true copy of the original document) must be submitted to Assignment Division in accordance with 37 CFR Part 3, if the assignment is to be recorded in the records of the PTO. See MPEP 302-302.8.)

The undersigned (whose title is supplied below) is empowered to sign this statement on behalf of the assignee.

April 7, 2000
Date


Signature

Gregory L. Bradley

Typed or printed name
Intellectual Property Counsel
and Assistant Secretary

Title

In re Reissue Continuation Application of:)	
)	
UBER et al.)	
)	Art Unit: 3737
U.S. Patent No.: 5,494,036)	
)	
Issued: February 27, 1996)	
)	Examiner: Brian L. Casler
Filed: November 26, 1993)	
)	
For: PATIENT INFUSION SYSTEM)	
FOR USE WITH MRI)	

Assistant Commissioner
for Patents
Box Reissue
Washington, D.C. 20231

Please enter the following amendments in the application before the examination
thereof on the merits:

Please add the following patent references, which were made of record in U.S. Patent No. 5,494,036 and listed thereon by means of a Certificate of Correction issued on February 25, 1997, to the Title Page:

<u>4,840,620</u>	<u>6/1989</u>	<u>Kobayashi et al.604/131</u>
<u>5,030,201</u>	<u>7/1991</u>	<u>Palestrant128/755</u>
<u>5,244,461</u>	<u>9/1991</u>	<u>Derlien128/Dig.1</u>

5,269,762	12/1993	Armbruster et al.	604/131
5,354,273	10/1994	Hagen.....	604/67

In the Claims:

Please amend original claims 1, 7 and 22 in U.S. Patent No. 5,494,036 as follows:

1. (Amended) A patient infusion control apparatus for use in a magnetic resonance imaging apparatus to generate images of a patient, the patient infusion control apparatus comprising:

- a) means for injecting fluid into the patient undergoing a MRI procedure;
- b) an electric drive motor and motor control circuitry positioned remotely from the means for injecting to be substantially non-reactive with an electromagnetic field of the imaging apparatus; [and]
- c) a non-rigid drive connection between the electric drive motor and the means for injecting comprising a flexible drive shaft; and
- d) at least one battery for powering the motor control circuitry and the electric drive motor and for minimizing electromagnetic interference with the magnetic resonance imaging apparatus.

7. (Amended) The patient infusion control apparatus of claim 1[, further comprising] wherein the at least one battery comprises a rechargeable battery [wherein the electric drive motor receives power from the rechargeable battery].

22. (Amended) A method of patient infusion for use with a magnetic resonance imaging system, the method comprising the steps of:

- a) providing patient infusion apparatus having a patient infusion apparatus controller and means operable to inject fluid into a patient;
- b) positioning the patient infusion apparatus controller away from the patient infusion apparatus to prevent interference in the image, the infusion apparatus controller including at least one electric motor and motor control circuitry, at least one battery for powering the motor control circuitry and the at least one motor and for minimizing electromagnetic interference with the magnetic resonance imaging system and the motor control circuitry; and
- c) operably connecting the electric motor for controlling the patient infusion apparatus to the patient infusion apparatus with a non-rigid drive connection, the electric motor operating the patient infusion apparatus to infuse media into a patient.

Please add the following new claims:

/ 24. A method of patient infusion for use with a magnetic resonance imaging system, the method comprising:
providing an infusion apparatus positioned within a room shielded from electromagnetic interference, the infusion apparatus comprising an injector for injecting fluid into patients during magnetic resonance imaging procedures and at least one battery for powering control circuitry and a drive mechanism of the injector and for minimizing electromagnetic interference with the magnetic resonance imaging system;

energizing the injector to inject fluid into one or more patients until the charge of the battery is substantially depleted; and

replacing the substantially depleted battery with a charged battery to energize the injector.

25. The method of claim 24, further comprising:

providing a system controller positioned external to the shielded room and in communication with the infusion apparatus for controlling the operation thereof, the system controller comprising a battery charger for charging batteries substantially depleted of charge by the injector.

✓ 26. A patient infusion system for use with a magnetic resonance imaging system, the patient infusion system comprising:

an infusion apparatus positioned within a room shielded from electromagnetic interference, the infusion apparatus operable to inject fluid into a patient during a magnetic resonance imaging procedure;

a battery for powering the infusion apparatus without substantial interference with the magnetic resonance imaging system; and

a system controller positioned external to the shielded room and in communication with the infusion apparatus for controlling the operation thereof.

27. The patient infusion system of claim 26 wherein the battery is rechargeable.

28. The patient infusion system of claim 26 wherein the system controller comprises a battery charger for recharging batteries depleted of charge by the injector.

29. The patient infusion system of claim 26 wherein the infusion apparatus comprises an injector and a control unit.

30. The patient infusion system of claims 29 wherein the injector and the control unit are separate units.

31. The patient infusion system of claim 30 wherein the injector and the control unit are connected by a non-rigid drive connection.

32. The patient infusion system of claim 30 wherein the control unit is remotely positioned from the injector.

33. The patient infusion system of claim 26 wherein the infusion apparatus is adapted to accommodate at least two syringes mounted thereon.

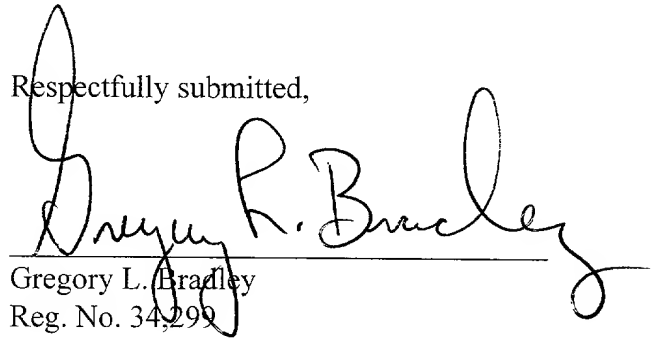
34. The patient infusion system of claim 26 wherein the infusion apparatus and the system controller communicate with each other by means of a communication link disposed therebetween.

Status of and Support for the Claims:

Original claims 1-23 are pending in the application.

New claims 24-34 have been added by this Preliminary Amendment. Claims 24 and 25 are supported by at least Col. 2, lines 53-59 and Col. 4, lines 1-3, of the specification and Figures 1 and 2 of the drawings. Claims 26-34 are supported by at least Col. 3, lines 42-67 and Col. 4, lines 1-3 and 11-26 of the specification and Figures 1 and 2 of the drawings.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Gregory L. Bradley", is written over a horizontal line. The signature is fluid and cursive.

Gregory L. Bradley
Reg. No. 34,299

Dated: April 7, 2000

Medrad, Inc.
One Medrad Drive
Indianola, PA 15051
(412) 767-2400 x3021

VI/96-068.re.c/PrelimAmd

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This invention relates generally to the field of Magnetic Resonance Imaging (MRI) systems for generating diagnostic images of a patient's internal organs and more particularly, this invention relates to improved MRI systems exhibiting decreased interference between the magnetic field used for producing diagnostic images and spurious magnetic fields created by ancillary equipment, such as the electric motors used for driving the pistons of the contrast media injectors. Additionally, the system employs an improved communication link between an externally located system controller and the injection head control unit which is located within the electromagnetic isolation barrier of the magnetic imaging suite.

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It has become recognized that MRI systems require isolation from external sources of electromagnetic fields, if optimum image quality is to be obtained from MRI diagnostic procedures. Conventional MRI systems have typically employed some form of electromagnetic isolation chamber which is generally a room enclosed by copper sheeting or conductive mesh material that isolates the room from undesirable sources of electromagnetic radiation and the electromagnetic noise inherent in the atmosphere.

In order to realize the full benefit of the shielded room, these systems employ a controller for the contrast media injector portion of the system which is isolated from the media injector. Such isolation is effected to prevent undesirable electromagnetic radiation generated by the system controller from interfering with the signals used to create the magnetic resonance images.

The external, isolated location of the system controller creates various problems associated with the installation and operation of these systems. One such problem is the need to provide a communications link between the externally located controller and the contrast media injectors, without introducing extraneous electromagnetic radiation. That is, there is a need to provide electrical power supply lines for operation of the contrast media injectors and the injector control circuitry while maintaining the integrity of the electromagnetic shield.

Previous attempts to solve these problems included drilling holes in the wall of the electromagnetic shield for inserting the necessary lines or, alternatively, laying the lines under a shielded floor of the imaging room. These alternatives have proven to be less than optimum, since spurious radiation arose from the presence of the various supply cables within the shielded imaging suite. Additionally, MRI systems which employed these solutions required substantial site dedication and were therefore not very portable.

Another problem associated with conventional magnetic resonance imaging systems is the interference which occurs between the high power magnetic field used for generating the magnetic resonance image and the magnetic fields created by the electric motors which control the operation of the contrast media injection heads. The magnetic field generated by the magnet of the magnetic resonance imaging system is extremely powerful and adversely affects the operation of the electric motors used in the injector head. Additionally, operation of the electric motors in close prox-

imity to the magnetic field used to generate the magnetic resonance image also has an adverse impact on the quality of the resulting image.

In conventional MRI systems, the injection head unit is located adjacent to the patient being examined and the electric motors associated with the injection syringes are directly connected to the syringe pistons. Characteristically, the syringes and the drive motors have been mounted on the injection head unit. The close proximity of the electric motors to the magnetic field used for generating the magnetic resonance image typically resulted in a decrease in motor performance and the ability to control the electric motors used in the injector heads, as well as an overall decrease in system performance.

Accordingly, it is an object of the present invention to provide an improved magnetic resonance imaging contrast media delivery system having decreased interference between the magnetic field used to obtain the magnetic resonance image and the magnetic fields created by ancillary equipment.

It is a further object of this invention to provide an MRI system which minimizes the interference between fields created by the electric motors used to drive the contrast media injection plungers and the magnetic field used to generate the magnetic resonance image.

It is another object of the present invention to provide an MRI contrast media injection system having an improved communication link between the system controller and the injection control unit.

Numerous other objects and advantages of the present invention will be apparent from the following summary, drawings and detailed description of the invention and its preferred embodiment; in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram outlining the functional design of the system; and,

FIG. 2 is a diagram illustrating the system of the present invention.

SUMMARY OF THE INVENTION

The invention compromises an improved magnetic resonance imaging system which decreases the amount of electromagnetic interference that has heretofore been found within a MRI isolation suite while increasing the portability and ease of system installation. The invention reduces deleterious interaction between the imaging magnetic field and the magnetic field generated by the electric motors which control and operate contrast media injectors.

The system includes a master controller located externally of the shielded imaging room within which a contrast media injection head and a separate injection control unit are located. The system controller communicates with the head control unit via external and internal transceivers which form a communications link for traversing the electromagnetic isolation barrier of the imaging room.

In the preferred embodiment, this communication link is made through a window in the isolation room barrier. These windows are typically in the form of a glass laminate containing a conductive wire mesh, or alternatively, a window that is coated with a thin sheet of conductive material such as gold to maintain the shielding characteristics of the isolation room. The communications link consists of electromagnetic transceivers which operate in a frequency range

which permeates the window while maintaining the integrity of the isolation barrier. Infrared or electromagnetic energy in the visual range provide the best results. Alternatively, a fiberoptic communication link can be used to provide the communication link, since fiberoptics do not create electro-
magnetic radiation. 5

The present invention also incorporates a contrast media injection unit located within the shielded room which comprises separate contrast media injector head and injection head control unit. The contrast media injection head, and specifically the syringe pistons are located in close proximity to the patient and consequently are located within the powerful magnetic field used to generate the magnetic resonance image. The head control unit which controls operation of the injector head is located from 10-15 feet away from the injector head control unit. The head control unit incorporates electric motors to control and to operate the pistons of syringes used for the injection of patients. A non-rigid operating drive connects the electric motors and control unit to the syringe pistons located on the injection head. In a preferred form, the drive connection can be by way of flexible shafts. Each flexible drive shaft forms a mechanical link between an electric motor located on the head control unit and a piston of the syringes on the injector head. Alternatively, a hydraulic system could be used to control the piston of the injector head. In the preferred embodiment, the flexible drive shaft is manufactured from a non-ferrous metal such as hard brass. The distancing of the head control unit and drive motors from the injector head decreases the adverse effects that the imaging magnetic field has on the electric motors of the injectors and conversely, the adverse affects of spurious electromagnetic radiation arising from operating of the electric motors used to control and operate the contrast media injectors is also reduced significantly. 35

DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 illustrates an improved magnetic resonance imaging system according to the present invention and is shown generally at 10. The MRI system includes a system controller 12 which incorporates a computer 14 and a battery charging unit 16. The system controller 12 is located externally of the imaging room 17, the imaging room being shielded from electromagnetic interference by a shield 18. Isolation can be achieved by completely enclosing the room with copper sheet material or some other suitable, conductive layer such as wire mesh. Communication line 20, connects the system controller 12 with an external infrared/optical communications transceiver 22. The shielded imaging room 17 also incorporates a patient viewing window 24 in the shield 18 which allows an observer to view the room without breaching the electromagnetic shield 18. The window 24 can be formed by sandwiching a wire mesh material (not shown) between sheets of glass or coating the window with a thin coating of conductive material such as gold (not shown) to maintain the continuity of the electromagnetic shield 18. 40 45 50 55

An infrared/optical communications transceiver 26 is positioned internally of the imaging room 17 at the viewing window 24 opposite the external communications transceiver 22 such that the internal and external communications transceivers communicate with each other through the viewing window with no breach of the electromagnetic shield. A communications link 28 located within the shielded area connects the internal infrared/optical transceiver with a 60 65

contrast media injection control unit 30. The injection control unit 30 is powered advantageously by rechargeable battery 32. The injection control unit 30 also incorporates control circuitry which controls electric motors 35, 36 which are also located within the injection control unit. The injection control unit is contained within an electromagnetic shield 37 to prevent the undesired electromagnetic radiation generated by the electric motors from interfering with the magnetic field used to generate the magnetic resonance image.

The injection control unit 30 is separated from the injection head unit 38 by as great a distance as possible. In the preferred embodiment, this is typically ten to fifteen feet. The injection head unit must be located in close proximity to the patient in order to decrease the distance that the contrast media fluid must travel from the contrast media injectors. The injection head unit 38 includes contrast media injection syringe and piston units 40, 42. The syringes 40, 42 are connected to the electric motors in the injection control unit by flexible mechanical drive shafts 44, 46, respectively. The drive shafts are made from a nonferrous metal such as hard brass.

The separation of the electric motors from the injection head, as well as the additional electromagnetic shielding, results in improved system performance and overall resulting image quality. Additionally, the use of an infrared/optical communications link results in a system which is both portable and easy to use.

What we claim is:

- ✓ 1. A patient infusion control apparatus for use in a magnetic resonance imaging apparatus to generate images of a patient, the patient infusion control apparatus comprising:
 - a) means for injecting fluid into the patient undergoing a MRI procedure;
 - b) an electric drive motor and motor control circuitry positioned remotely from the means for injecting to be substantially non-reactive with an electromagnetic field of the imaging apparatus; and,
 - c) a non-rigid drive connection between the electric drive motor and the means for injecting comprising a flexible drive shaft.
2. The patient infusion control apparatus of claim 1 wherein the electric drive motor and motor control circuitry are enclosed within electromagnetic shielding.
3. The patient infusion control apparatus of claim 1, wherein the patient injection means is adapted to be located in close proximity to the patient.
4. The patient infusion control apparatus of claim 1, wherein said flexible drive shaft is comprised of hard brass.
5. The patient infusion control apparatus of claim 1, wherein the motor is positioned at least ten to fifteen feet from the patient injection means.
6. The patient infusion control apparatus of claim 1, wherein the electric drive motor and the motor control circuitry are enclosed in an electromagnetic shield.
7. The patient infusion control apparatus of claim 1, further comprising a rechargeable battery wherein the electric drive motor receives power from the rechargeable battery.
- ✓ 8. A patient infusion system for use with a magnetic resonance imaging system, the patient infusion system comprising:
 - a) a room shielded from electromagnetic interference;
 - b) a system controller located externally of the shielded room;
 - c) a patient infusion apparatus including infusion apparatus control means for controlling an infusion opera-

d) a fiber optic communications link between the system controller and the infusion apparatus control means.

a) a room shielded from electromagnetic interference, which includes a viewing window;

c) a patient infusion apparatus within the shielded room and including infusion apparatus control means for controlling an infusion operation; and,

10. The patient infusion system of claim 9, wherein the communications link includes means for transmitting and receiving electromagnetic radiation through the viewing window.

12. The patient infusion system of claim 9, wherein the communications link includes means for transmitting and 25 receiving electromagnetic energy in the visual range.

a) a room shielded from electromagnetic interference by an electromagnetic shield including a viewing window;

c) a patient infusion apparatus located inside the room including infusion apparatus control means for controlling an infusion operation;

d) a communications link between the system controller and the infusion apparatus control means; and,

e) an electric drive motor and motor control circuitry separated from the patient infusion apparatus and a non-rigid drive connection between the electric drive motor and the patient infusion apparatus whereby the motor is positioned to be substantially non-reactive with an electromagnetic field of the imaging system.

14. The patient infusion system of claim 13, wherein the 45
communications link comprises an external transceiver
located outside the room and an internal transceiver located
inside the room, both said transceivers communicating elec-
tromagnetic energy through the viewing window in the
room. 50

15. The patient infusion system of claim 14, wherein the electromagnetic energy communicated between said transceivers is in the visible light spectrum.

16. The patient infusion system of claim 14, wherein said electromagnetic energy communicated between said transceivers is in the infrared spectrum.

5 17. The patient infusion system of claim 13, further comprising a rechargeable battery located in the room and connected to the electric drive motor for providing power to the electric drive motor.

10 18. The patient infusion system of claim 13, wherein the electric drive motor and motor control circuitry are enclosed within the electromagnetic shield.

19. The patient infusion system of claim 13, wherein the infusion apparatus control means is adapted to be located at least ten to fifteen feet from the patient.

15 20. The patient infusion system of claim 13, wherein the non-rigid drive connection is comprised of hard brass.

21. The patient infusion system of claim 13, wherein the patient infusion apparatus is adapted to be located in close proximity to the patient.

20 22. A method of patient infusion for use with a magnetic resonance imaging system, the method comprising the steps of:

25 a) providing patient infusion apparatus having a patient infusion apparatus controller and means operable to inject fluid into a patient;

30 b) positioning the patient infusion apparatus controller away from the patient infusion apparatus to prevent interference in the image, the infusion apparatus controller including at least one electric motor and motor control circuitry; and

35 c) operably connecting the electric motor for controlling the patient infusion apparatus to the patient infusion apparatus with a non-rigid drive connection, the electric motor operating the patient infusion apparatus to infuse media into a patient.

40 23. A method of patient infusion for use with a magnetic resonance imaging system, the method comprising the steps of:

a) providing a room shielded from electromagnetic interference including a viewing window;

b) providing a system controller located outside the room;

45 c) providing a patient infusion apparatus including infusion apparatus control means for controlling an infusion operation, the patient infusion apparatus located inside the room; and

50 d) transmitting control signals from the system controller to the infusion apparatus control means through the viewing window.

* * * * *



US005494036A

[11] Patent Number: 5,494,036

[45] Date of Patent: Feb. 27, 1996

4,981,137 1/1991 Kondo et al. .
5,134,373 7/1992 Tsuruno et al. .
5,300,031 4/1994 Neer et al. 128/655 X

FOREIGN PATENT DOCUMENTS

105550A1 9/1983 European Pat. Off. .
518100A1 5/1992 European Pat. Off. .
495287A3 6/1992 European Pat. Off. .

Primary Examiner—William E. Kamm

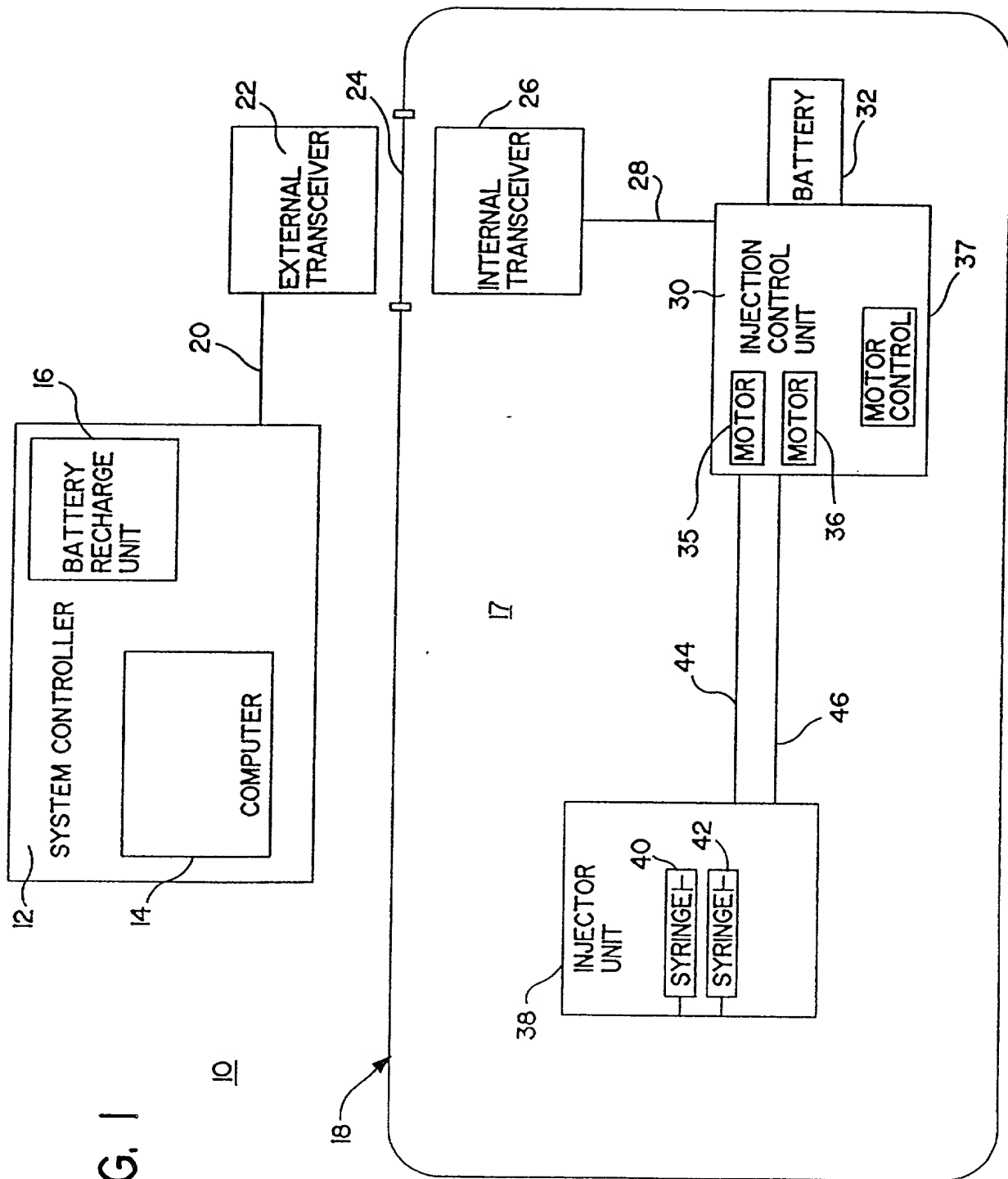
Assistant Examiner—Brian L. Casler

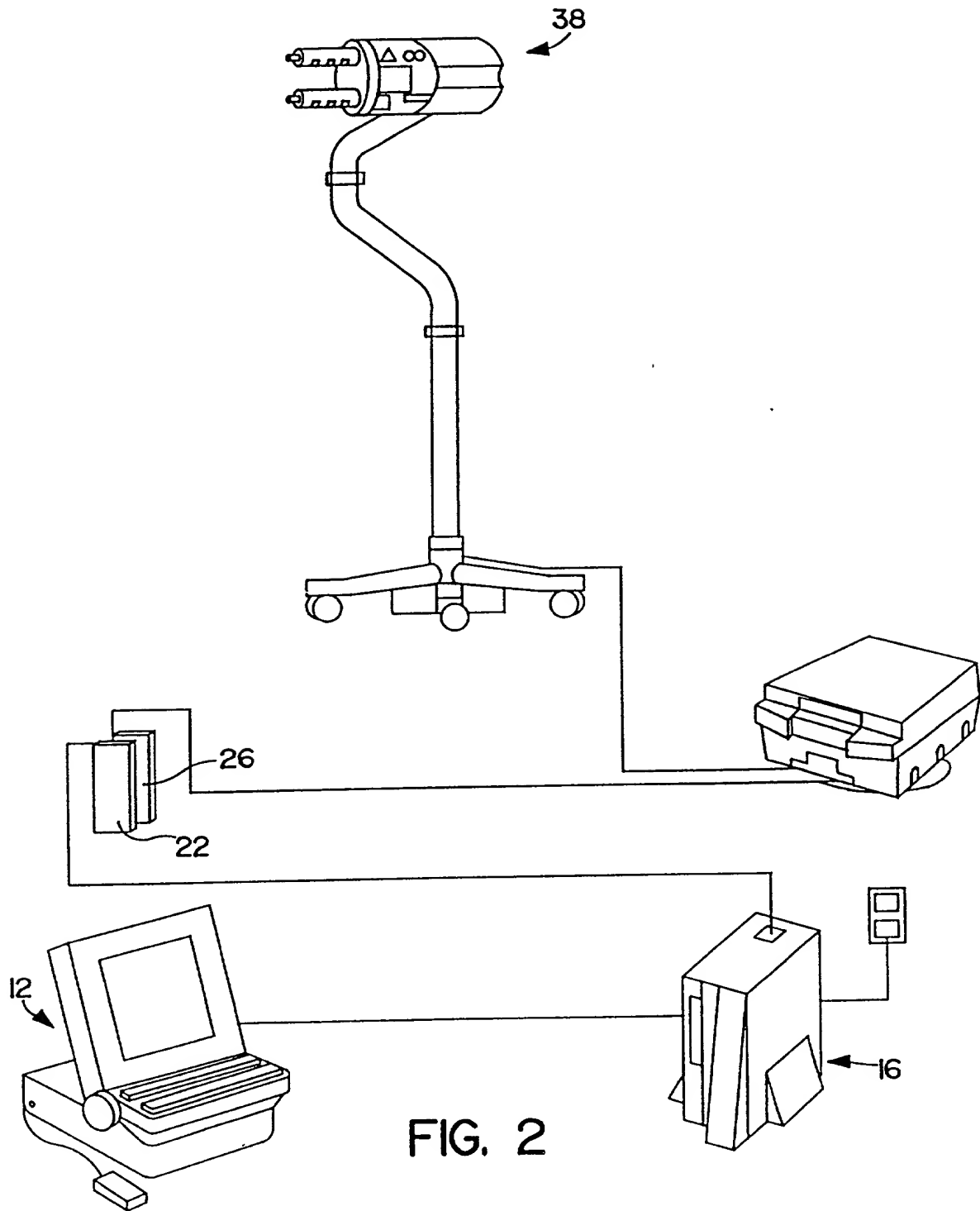
[57] ABSTRACT

This invention relates generally to the field of Magnetic Resonance Imaging (MRI) systems for generating diagnostic images of a patient's internal organs and more particularly, this invention relates to improved MRI systems with decreased interference between the magnetic field used for producing diagnostic images and the magnetic fields generated by the electric motors used for driving the pistons of the contrast media injectors. Additionally, the system employs an improved communication link between an externally located system controller and the injection head control unit located within the electromagnetic isolation barrier which defines the magnetic imaging room.

23 Claims, 2 Drawing Sheets

004036A





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U.S. Patent No.: 5,494,036)
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For: PATIENT INFUSION SYSTEM)
FOR USE WITH MRI)

REISSUE DECLARATION

Assistant Commissioner
for Patents
Box Patent Application
Washington, D.C. 20231

Dear Sir:

We, Arthur E. Uber, III, Seid Waddell, John Stulen and Jon E. Manley, hereby declare that: our residences, post office addresses and citizenship are as stated below next to our names; we believe that we are the original, first and sole inventors of the subject matter described and claimed in U.S. Patent No. 5,494,036, granted on February 27, 1996, and for which a reissue patent is sought on the invention entitled "Patient Infusion System For Use With MRI," the specification of which is attached hereto; we have reviewed and understand the contents of the above-identified reissue application, including the new and broadened claims therein; we acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56; for the reasons provided below, we verily believe the original

patent to be partly inoperative; and all errors relied upon above and corrected in this reissue application arose without any deceptive intention on our part.

We believe the original patent to be partly inoperative by reason of our claiming less than we had a right to claim in the patent. Specifically, we claimed less than we had a right to claim by failing to independently claim certain features of our invention, such as a dual-syringe injector and a battery-powered injector. Because we claimed less than we had a right to claim in the original patent, we wish to broaden the claims present in the original patent.

We hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issued thereon, or any patent to which this Declaration is directed.

Full Name of Joint Inventor:

Arthur E. Uber, III

Inventor's Signature:

Arthur E. Uber, III Date: 2/17/98

Residence:

Pittsburgh, Pennsylvania

Citizenship:

USA

Post Office Address:

7426 Ben Hur Street
Pittsburgh, Pennsylvania 15208

Full Name of Joint Inventor:

Seid Waddell

Inventor's Signature: _____

Date: _____

Residence:

Vermilion, Ohio

Citizenship:

USA

Post Office Address:

272 Woodridge Road

Vermilion, Ohio 44089

Full Name of Joint Inventor:

John Stulen

Inventor's Signature: _____

Date: _____

Residence:

Pittsburgh, Pennsylvania

Citizenship:

USA

Post Office Address:

260 Crestmont Road

Pittsburgh, Pennsylvania 15237

Full Name of Joint Inventor:

Jon E. Manley

Inventor's Signature: _____

Date: _____

Residence:

Pittsburgh, Pennsylvania

Citizenship:

USA

Post Office Address:

5411 Stanton Avenue

Pittsburgh, Pennsylvania 15206

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Reissue Application of:)
)
UBER et al.)
)
U.S. Patent No.: 5,494,036)
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For: PATIENT INFUSION SYSTEM)
FOR USE WITH MRI)

REISSUE DECLARATION

Assistant Commissioner
for Patents
Box Patent Application
Washington, D.C. 20231

Dear Sir:

We, Arthur E. Uber, III, Seid Waddell, John Stulen and Jon E. Manley, hereby declare that: our residences, post office addresses and citizenship are as stated below next to our names; we believe that we are the original, first and sole inventors of the subject matter described and claimed in U.S. Patent No. 5,494,036, granted on February 27, 1996, and for which a reissue patent is sought on the invention entitled "Patient Infusion System For Use With MRI," the specification of which is attached hereto; we have reviewed and understand the contents of the above-identified reissue application, including the new and broadened claims therein; we acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56; for the reasons provided below, we verily believe the original

patent to be partly inoperative; and all errors relied upon above and corrected in this reissue application arose without any deceptive intention on our part.

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We hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issued thereon, or any patent to which this Declaration is directed.

Full Name of Joint Inventor:

Arthur E. Uber, III

Inventor's Signature:

_____ Date: _____

Residence:

Pittsburgh, Pennsylvania

Citizenship:

USA

Post Office Address:

7426 Ben Hur Street
Pittsburgh, Pennsylvania 15208

Full Name of Joint Inventor:

Seid Waddell

Inventor's Signature:

Seid Waddell Date: 2/14/98

Residence:

Vermilion, Ohio

Citizenship:

USA

Post Office Address:

272 Woodridge Road
Vermilion, Ohio 44089

Full Name of Joint Inventor:

John Stulen

Inventor's Signature:

_____ Date: _____

Residence:

Pittsburgh, Pennsylvania

Citizenship:

USA

Post Office Address:

260 Crestmont Road
Pittsburgh, Pennsylvania 15237

Full Name of Joint Inventor:

Jon E. Manley

Inventor's Signature:

_____ Date: _____

Residence:

USA

Citizenship:

Post Office Address:

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Reissue Application of:)
)
 UBER et al.)
)
 U.S. Patent No.: 5,494,036)
)
 Issued: February 27, 1996)
)
 Filed: November 26, 1993)
)
 For: PATIENT INFUSION SYSTEM)
 FOR USE WITH MRI)

REISSUE DECLARATION

Assistant Commissioner
for Patents
Box Patent Application
Washington, D.C. 20231

Dear Sir:

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Inventor's Signature:

Date: 2/18/98

Residence:

Pittsburgh, Pennsylvania

Citizenship:

USA

Post Office Address:

260 Crestmont Road
Pittsburgh, Pennsylvania 15237

Full Name of Joint Inventor:

Jon E. Manley

Inventor's Signature:

Date: _____

Residence:

Pittsburgh, Pennsylvania

Citizenship:

USA

Post Office Address:

5411 Stanton Avenue
Pittsburgh, Pennsylvania 15206

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Reissue Application of:)
)
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Date: _____

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Pittsburgh, Pennsylvania 15208

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Date: _____

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Pittsburgh, Pennsylvania

Citizenship:

USA

Post Office Address:

260 Crestmont Road
Pittsburgh, Pennsylvania 15237

Full Name of Joint Inventor:

Jon E. Manley

Inventor's Signature:

Jon E. Manley Date: Feb 20, 1998

Residence:

Frederick, Maryland

Citizenship:

USA

Post Office Address:


8233 Glendale Drive
Frederick, Maryland 21702

In re Reissue Continuation Application of:)	
)	
UBER et al.)	
)	
U.S. Patent No.: 5,494,036)	Art Unit: 3737
)	
Issued: February 27, 1996)	
)	
Filed: November 26, 1993)	Examiner: Brian L. Casler
)	
For: PATIENT INFUSION SYSTEM)	
FOR USE WITH MRI)	

Assistant Commissioner
for Patents
Box Reissue
Washington, D.C. 20231

In accordance with 37 C.F.R. § 1.178, Applicants have surrendered original Letters Patent No. 5,494,036, granted on February 27, 1996, for "Patient Infusion System For Use With MRI," during the prosecution of parent Reissue Application No. 09/027,852, now U.S. Reissue Patent No. 36,648.

648.



Gregory L. Bradley
Reg. No. 34,299

VI/96-068 re c/Surrender

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

POWER OF ATTORNEY

Docket No.

VI/96-068.RE.C

Name of Applicant: **MEDRAD, INC.**
Address of Applicant: **One Medrad Drive**
Indianola, PA 15051

Title: **PATIENT INFUSION SYSTEM FOR USE WITH MRI**

Serial No., if Any:

Filed:

TO THE ASSISTANT COMMISSIONER FOR PATENTS

The Assistant Commissioner for Patents
Washington, D.C. 20231

Honorable Sir:
I hereby appoint:

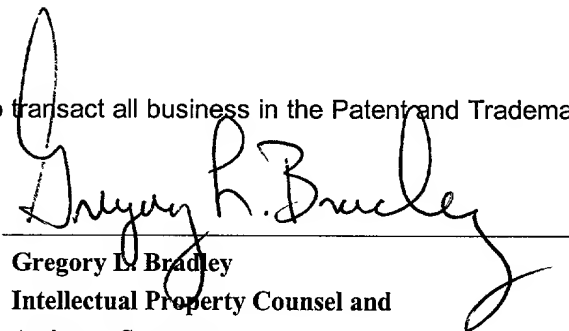
Gregory L. Bradley, Frederick H. Colen, Cheryl L. Gastineau, Henry E. Bartony, Ruth N. Morduch

as principal attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

Please direct all future correspondence to:

Gregory L. Bradley
MEDRAD, INC.
One Medrad Drive
Indianola, PA 15051

By:


Gregory L. Bradley
Intellectual Property Counsel and
Assistant Secretary
MEDRAD, INC.

Dated: April 7, 2000

